

Functional Inflammolgy (.com): Definition and Scope: An evidence-based clinical approach to the prevention, management, comanagement, and cure of the majority of so-called “chronic diseases” that are increasingly in epidemic proportions worldwide; examples include diabetes, hypertension, obesity, migraine, neurodegeneration, fibromyalgia, and disorders of allergic and autoimmune inflammation. **Safety, Efficacy, Ethics:** Remarkable safety and efficacy; allows clinicians to meet all criteria of medical ethics: ❶ beneficence, ❷ non-maleficance, ❸ autonomy, ❹ informed consent, ❺ distributive justice. **Refutations/Affirmations:** The “chronic disease model” is refuted and replaced by the view that **most so-called “chronic inflammatory diseases”** are simply **“sustained inflammatory responses”** to factors which can be clinically corrected; these seven primary factors are effectively addressed by the Functional Inflammolgy Clinical Protocol.

Inflammation Mastery 4th Edition combines the recently updated **Functional Inflammolgy** and Dr Vasquez’s previous **Integrative Rheumatology** into a new colorized updated textbook of almost 1,200 pages. This work is the culmination of several thousand research publications combined with Dr Vasquez’s many years of clinical experience and teaching graduate-level students and doctorate-level clinicians worldwide. With radiographs, photos, acronyms, illustrations, flowcharts, and detailed-yet-simplifying explanations, Dr Vasquez makes it easier than ever for clinicians to grasp important concepts in integrative care and functional medicine and then to translate the basic science research and molecular biology into treatment plans that can be explained and used in “the real world” of clinical practice with patients. The associated video tutorials and recorded live conference presentations further help students and clinicians “get it” via Dr Vasquez’s effective teaching style which embraces complexity while always emphasizing clinical applicability and psychosocial context. The **Inflammation Mastery & Functional Inflammolgy series of books and videos** translates important concepts and nutritional/biomedical science into easy and practical clinical applications for the prevention and treatment of disorders of sustained inflammation, which Dr Vasquez describes as “patterns of metabolic disturbance and inflammatory dysfunction” existing in three sequential and overlapping categories: 1) metabolic inflammation, 2) allergic inflammation, 3) autoimmune inflammation. This book includes access to video presentations which introduce the origin and components of the Functional Inflammolgy Protocol and **FINDSEX®** acronym. Post-publication updates to this information and important social and clinical contextualization are made available in videos and online repositories (access provided in the book), and the e-newsletter available from **InflammationMastery** and **FunctionalInflammolgy.com**. This textbook also provides access, via reprints or hyperlinks, to Dr Vasquez’s published articles—an example of which is his recent paradigm-shifting editorial published in the journal *Alternative Therapies in Health and Medicine* (2014 January). The updated section on pain management allows students and clinicians to understand and apply manual, pharmacologic, nutritional and botanical medicine treatments for musculoskeletal pain, thereby providing better relief for patients and avoiding the hazards of NSAIDs, coxibs, steroids, opioids, immunosuppressants and biologics.

About the author—Dr Alex Vasquez: Dr Alex Vasquez holds three doctoral degrees as a graduate of University of Western States (Doctor of Chiropractic, 1996), Bastyr University (Doctor of Naturopathic Medicine, 1999), and University of North Texas Health Science Center, Texas College of Osteopathic Medicine (Doctor of Osteopathic Medicine, 2010). Dr Vasquez is the author of many textbooks, including *Integrative Orthopedics* (2004/2012), *Integrative Rheumatology* (2006/2014), *Musculoskeletal Pain: Expanded Clinical Strategies* (published by the Institute for Functional Medicine, 2008), *Chiropractic and Naturopathic Mastery of Common Clinical Disorders* (2009), *Integrative Medicine and Functional Medicine for Chronic Hypertension* (2011), *Fibromyalgia in a Nutshell* (2012), *Migraine Headaches, Hypothyroidism, and Fibromyalgia* (2012), *Mitochondrial Nutrition and Mitochondrial Medicine for Primary Care Conditions* (2014), and *Dysbiosis in Human Disease* (2014), which is also an excerpt from *Functional Inflammolgy: Volume I*. “DrV” has also written more than 110 letters and articles for professional magazines and medical journals such as *British Medical Journal* (BMJ), *TheLancet.com*, *Annals of Pharmacotherapy*, *Journal of Clinical Endocrinology and Metabolism*, *Journal of the American Medical Association* (JAMA), *Alternative Therapies in Health and Medicine*, *Journal of the American Osteopathic Association* (JAOA), *Nutritional Perspectives*, *Journal of Manipulative and Physiological Therapeutics* (JMPT), *Current Allergy and Asthma Reports*, *Integrative Medicine*, and *Arthritis & Rheumatism*, the



Official Journal of the American College of Rheumatology. Dr Vasquez has lectured worldwide to healthcare professionals and provides expert consultations to physicians and patients internationally. All of DrV’s books are available on [Amazon.com](https://www.amazon.com/DrVasquez) with videos at [Vimeo.com/DrVasquez](https://www.Vimeo.com/DrVasquez) and audio recordings of lectures at [iTunes](https://www.iTunes).

About the International College of Human Nutrition and Functional Medicine (ICHNFM): International College of Human Nutrition and Functional Medicine was founded by a group of internationally-located world-class experts to provide higher-level training in nutrition and functional medicine to students and clinicians worldwide in Spanish, English, Portuguese, Catalan, and other languages. Originally founded in North America (Portland Oregon USA) and launched with the tremendously successful 2013 International Conference on Human Nutrition and Functional Medicine (described at [ICHNFM.ORG](https://www.ICHNFM.ORG) with select videos available at [Vimeo.com/ICHNFM](https://www.Vimeo.com/ICHNFM)), the organization is also now established in Europe (Spain) with several important publications also generated from in South America (Colombia). Dr Vasquez and his colleagues at ICHNFM provide educational courses, videos, written materials, and mentoring for students and clinicians to promote the expert-level application of clinical nutrition and functional medicine. Via forums and live interactive online classes, professors and students are able to interact, network, and share important insights, clinical experiences and case reports, effective doses of nutrients and prescription medicines, additional citations to research, important clinical pearls, and expanded discussions on various topics as the research and clinical practice of human nutrition and functional medicine continuously advance. International College of Human Nutrition and Functional Medicine®, *International Journal of Human Nutrition and Functional Medicine*® ([IntJHumNutrFuncMed.ORG](https://www.IntJHumNutrFuncMed.ORG)), and International Conference on Human Nutrition and Functional Medicine® are all registered trademarks™ legally held and internationally protected by the International College of Human Nutrition and Functional Medicine.

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- Sections and Topics**
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 - ♦ **Chapter 1: Concepts and Approach to Patient Assessment and Clinical Interpretation of Laboratory Tests:** Also includes sections on risk management, musculoskeletal emergencies, hemochromatosis and hypothyroidism
 - ♦ **Chapter 2: ReEstablishing the Foundation for Health:** Evidence-based wellness promotion and lifestyle-based health optimization
 - ♦ **Chapter 3: Basics of (Nondrug) Integrative Pain Management and Musculoskeletal Care:** Useful data, tools, and acronyms reviewing botanical medicines, ergonomics, nutritional supplementation, diet, neuromuscular stabilization, trigger point treatment, manual medicine; includes a complete clinical review of nutritional and manipulative treatments for carpal tunnel syndrome
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 - ♦ Psoriasis and Psoriatic Arthritis
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 - ♦ Scleroderma & Systemic Sclerosis
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 - ♦ Sjögren Syndrome/Disease
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 - ♦ Clinical Notes on Additional Conditions: Behçet’s Disease, Sarcoidosis, Dermatomyositis and Polymyositis
 - ♦ **Index and Appendix**

INFLAMMATION MASTERY 4TH ED.

Clinical Nutrition, Functional Medicine, Inflammolgy, Integrative Pain Management, Rheumatology, Immunomodulation, Immunonutrition & Antiviral Strategies • Vasquez

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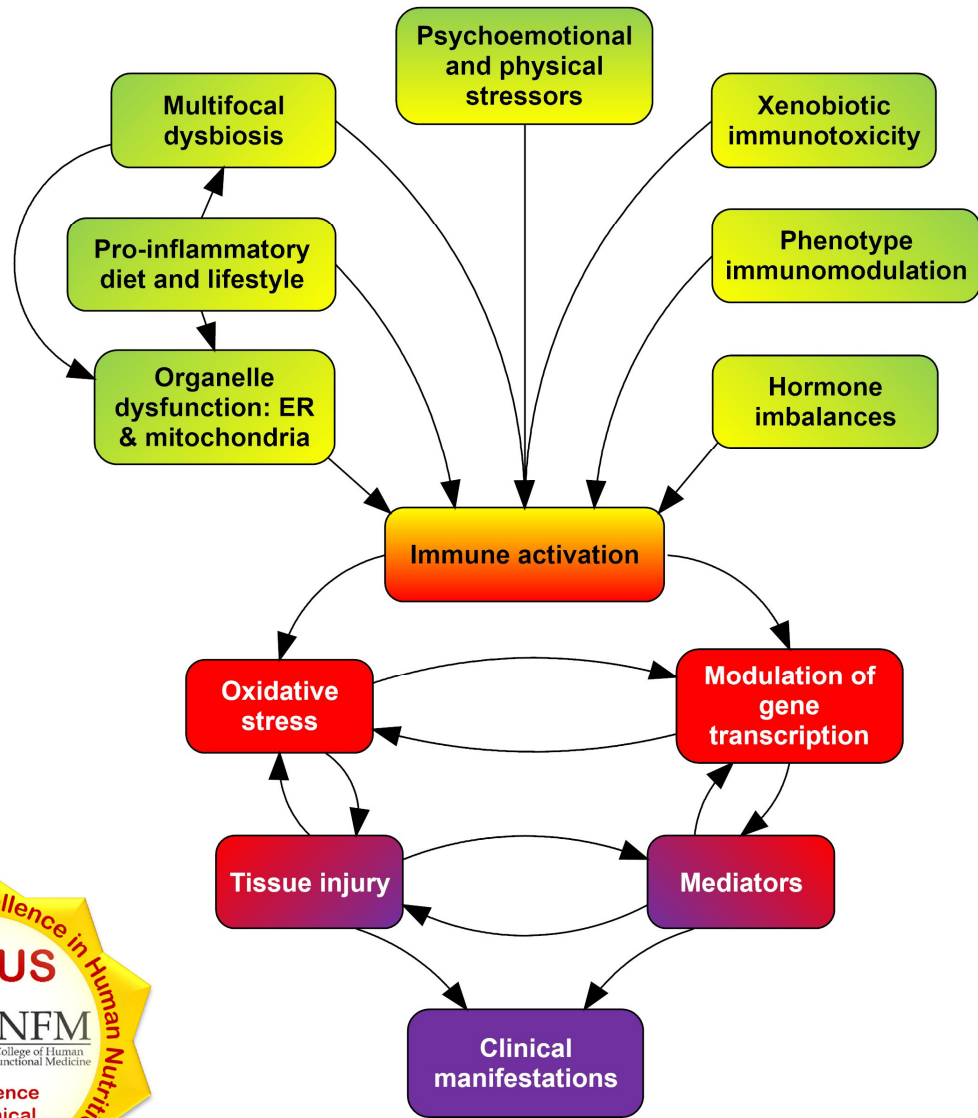
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and away from the Boredom, Risks, Costs, and Inefficacy of
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A Three-Part Learning System of Text, Images, and Video

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Notices: The intended audiences for this book are health science students and doctorate-level licensed medical clinicians. This book has been written with every intention to make it as accurate as possible, and each section has undergone peer-review by an interdisciplinary group of clinicians. In view of the possibility of human error and as well as ongoing discoveries in the biomedical sciences, neither the author nor any party associated in any way with this text warrants that this text is perfect, accurate, or complete in every way, and all disclaim responsibility for harm or loss associated with the application of the material herein. Information and treatments applicable to a specific *condition* may not be appropriate for or applicable to a specific patient; this is especially true for patients with multiple comorbidities and those taking pharmaceutical medications, which are generally associated with multiple adverse effects and drug/nutrient/herb interactions. Given that this book is available on an open market, lay persons who read this material should discuss the information with a licensed medical provider before implementing any treatments and interventions described herein.

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Dedications: I dedicate this book to the following people in appreciation for their works, their direct and indirect support of this work, and for their contributions to the advancement of true healthcare.

- **To the students and practitioners of naturopathic/functional medicine**, those who continue to learn so that they can provide the best possible care to their patients
- **To the researchers** whose works are cited in this text
- **To Dr Alan Gaby and Dr Jeffrey Bland**, my most memorable and influential *personal* professors and mentors
 - Dr Gaby's diligent scholarship of the medical nutrition literature laid the evidence-based foundation for nearly all of us; his *Nutritional Medicine* is an excellent companion text to compliment this volume
 - Dr Bland deserves credit for being the primary developer of the American rendition of "functional medicine", a conceptual framework and clinical model used and discussed in this text. While development and continuous maturation of the functional medicine model has depended upon numerous researchers and clinicians, Dr Bland was clearly the pioneer for this concept circa 1993 and the nucleus around which many of us have worked (at least initially) in this regard.
- **To Henry Rollins**, in particular for his prose book *One from None*, which completely changed my life in 1991
- **To Dr Linus Pauling**, for modeling the combination of scientific scholarship (Nobel Prize in Chemistry 1954) and social engagement (Nobel Peace Prize 1962)
- **To Dr Friedrich Nietzsche and Dr Noam Chomsky**, my most memorable and influential *virtual* professors and mentors, both of whom exemplify profound scholarship and intellectual independence in favor of developing the highest possible human culture on earth
- **To Dr Robert Richard**, my clinical mentor in general outpatient medicine—a truly exemplary clinician
- **To Dr Bruce Ames¹ and Dr Roger J Williams²**, for proving the importance of biochemical individuality
- **To Dr Chester Wilk^{3,4} and important others^{5,6,7}** for documenting and resisting the organized oppression of natural, non-pharmaceutical, non-surgical healthcare
- **To Jorge Strunz and Ardeshir Farah**, for daily artistic inspiration since my first listen of *Primal Magic* in 1992

Acknowledgments for Peer and Editorial Review of Earlier Versions of This Work: Most of the sections that comprise the current work have been previously reviewed/published/presented; peer/editorial reviews are acknowledged below. Acknowledgement here does not imply that the reviewer fully agrees with or endorses the material in this text but rather that they were willing to review specific sections of the book for clinical applicability and clarity and to make suggestions to their own level of satisfaction.

- **2016 Edition of *Inflammation Mastery* and the excerpt *Pain Revolution for Migraine and Fibromyalgia*:** Sabrina Piper BSc (2016 ND candidate), John Bartemus DC BCIM CFMP DACBN, Elizabeth Busetto DC ND, Kenneth Cintron MD
- **2015 Edition of *Human Microbiome and Dysbiosis in Clinical Disease*:** Julie Jean BS BSN RN, Joseph Iaccino DC MSc
- **2014 Edition of *Antiviral Strategies and Immune Nutrition*:** Annette D'Armata ND, Elizabeth Busetto DC ND
- **2014 Edition of *Naturopathic Rheumatology*:** Annette D'Armata ND
- **2012 Edition of *Fibromyalgia in a Nutshell*:** Lisa Scholl BA, Annette D'Armata ND
- **2012 Edition of *Migraine Headaches, Hypothyroidism, and Fibromyalgia*:** Holly Furlong DC
- **2011 Edition of *Integrative Chiropractic Management of High Blood Pressure and Chronic Hypertension*:** Barry Morgan MD, Holly Furlong DC, Kris Young DC, Erika Mennerick DC, and J William Beakey DOM
- **2011 Edition of *Integrative Medicine and Functional Medicine for Chronic Hypertension*:** Erika Mennerick DC, JoAnn Fawcett DC, Ileana Bourland MSOM LAc, James Bogash DC, J William Beakey DOM
- **2010 Edition of *Chiropractic Management of Chronic Hypertension*:** Joseph Paun MS DC, David Candelario OMS4 (TCOM c/o 2010), James Bogash DC, Bill Beakey DOM, Robert Richard DO
- **2009 Edition of *Chiropractic and Naturopathic Mastery of Common Clinical Disorders*:** Heather Kahn MD, Robert Richard DO, James Leiber DO, David Candelario (UNT-HSC TCOM OMS4)
- **2007 Edition of *Integrative Orthopedics*:** Barry Morgan MD, Dennis Harris DC, Richard Brown DC (DACBI candidate), Ron Mariotti ND, Patrick Makarewich MBA, Reena Singh (SCNM ND4), Zachary Watkins DC, Charles Novak MS DC, Marnie Loomis ND, James Bogash DC, Sara Croteau DC, Kris Young DC, Joshua Levitt ND, Jack Powell III MD, Chad Kessler MD, Amy Neuzil ND
- **2006 Edition of *Integrative Rheumatology*:** Amy Neuzil ND, Cathryn Harbor MD, Julian Vickers DC, Tamara Sachs MD, Bob Sager BSc MD DABFM (Clinical Instructor in the Department of Family Medicine, University of Kansas), Ron

¹ Ames BN, et al. High-dose vitamin therapy stimulates variant enzymes with decreased coenzyme binding affinity (increased K(m). *Am J Clin Nutr.* 2002 Apr;75:616-58

² Williams RJ. *Biochemical Individuality: The Basis for the Genetotrophic Concept.* Austin and London: University of Texas Press; 1956

³ Wilk CA. *Medicine, Monopolies, and Malice: How the Medical Establishment Tried to Destroy Chiropractic.* Garden City Park: Avery, 1996

⁴ Getzendanner S. Permanent injunction order against AMA. *JAMA.* 1988 Jan 1;259(1):81-2

⁵ Carter JP. *Racketeering in Medicine: The Suppression of Alternatives.* Norfolk: Hampton Roads Pub; 1993

⁶ Morley J, Rosner AL, Redwood D. A case study of misrepresentation of the scientific literature: recent reviews of chiropractic. *J Altern Complement Med.* 2001;7:65-78

⁷ Terrett AG. Misuse of the literature by medical authors in discussing spinal manipulative therapy injury. *J Manipulative Physiol Ther.* 1995 May;18(4):203-10

Mariotti ND, Titus Chiu (DC4), Zachary Watkins (DC4), Gilbert Manso MD, Bruce Milliman ND, William Groskopp DC, Robert Silverman DC, Matthew Breske (DC4), Dean Neary ND, Thomas Walton DC, Fraser Smith ND, Ladd Carlston DC, David Jones MD, Joshua Levitt ND

- 2004 Edition of Integrative Orthopedics: Peter Knight ND, Kent Littleton ND MS, Barry Morgan MD, Ron Hobbs ND, Joshua Levitt ND, John Neustadt (Bastyr ND4), Allison Gandre BS (Bastyr ND4), Peter Kimble ND, Jack Powell III MD, Chad Kessler MD, Mike Gruber MD, Deirdre O'Neill ND, Mary Webb ND, Leslie Charles ND, Amy Neuzil ND

Format and Layout: The format/layout of this book is designed to efficiently take the reader through the clinically relevant spectrum of considerations for each condition that is detailed. Important topics are given their own section within each chapter, while other less important or less common conditions are only described briefly in terms of the four “clinical essentials” of 1) definition/pathophysiology, 2) clinical presentation, 3) assessment/diagnosis, and 4) treatment/management. Each of the expanded sections that details the more important/common conditions maintains a consistent format, taking the reader through the spectrum of primary clinical considerations: definition/pathophysiology, clinical presentations, differential diagnoses, assessments (physical examination, laboratory, imaging), complications, management, and treatment. As my books have progressed, I am increasingly using an article-by-article review format (especially in the sections on management and treatment) so that readers have more direct access to the information so as to understand and *incorporate* more deeply what the research actually states; the goal and general approach here is to use a *representative sampling* of the research literature.

References and Citations: Citations to articles, abstracts, texts, and personal communications are footnoted throughout the text to provide supporting information and to provide interested readers the resources to find additional information. Many of the cited articles are available on-line for free, and often I have included the website addresses so that readers can easily access the complete article.

Peer-review and Quality Control: Peer-review is essential to help ensure accuracy and clinical applicability of health-related information. Consistent with the importance of these goals, I have employed several “checks and balances” to increase the accuracy and applicability of the information within my textbooks:

- Reliance upon authoritative references: Nearly all important statements are referenced to peer-reviewed biomedical journals or authoritative texts, examples of the latter include *The Merck Manual*, *Current Medical Diagnosis and Treatment*, and *5-Minute Clinical Consult*. Each citation is provided by a footnote at the bottom of each page so that readers will know quickly and easily exactly where the information was obtained.
- Extensive cross-referencing: Readers will notice the supranormal number of references and citations. Many important statements have several references. Many references (especially textbooks) are referenced several times even on the same page; the purpose of this extensive referencing is three-fold: 1) to guide you—the reader—to additional information, 2) to help me (as writer) stay organized, and 3) to help you and me (the practicing physicians) employ this information with confidence. In more recent updates/revisions, I have started shortening the number of listed authors by frequent use of *et al* with an interest in keeping each citation to one line of text on the page, likewise reducing mental and eye strain; quite obviously I respect each of the authors—even those whose names are not listed in the citation—and am implementing this solely for the sake of efficient book formatting (aiming for one citation per line) and information density (fewer lines dedicated to citations allows more space for text and images). Given hundreds of pages and thousands of citations, formatting considerations such as these are summatively significant.
- Periodic revision: Any significant errors that are discovered will be posted at InflammationMastery.com/volume1 (...[volume2](http://InflammationMastery.com/volume2), etc); please check these folders periodically to ensure that you are working with the most accurate information of which I am aware.
- Peer-review: The peer-review process for my books takes several forms. First, colleagues and students are invited to review new and revised sections of the text before publication; every section of the book that you are holding has been independently reviewed by health science students and/or practicing clinicians from various backgrounds: allopathic, chiropractic, osteopathic, naturopathic. Second, you - the reader - are invited to provide feedback about the information in the book, typographical errors, syntax, case reports, new research, etc. If your ideas truly change the nature of the material, I will be glad to acknowledge you in the text (with your permission, of course). If your contribution is hugely significant, such as reviewing three or more chapters or helping in some important way, I will be glad to not only acknowledge you, but to also send you the next edition at a discount or courtesy when your ideas take effect. Third, I keep abreast of new literature by constantly perusing new research and advancements in the health sciences. Having been successful in three separate doctoral programs in the health sciences, I have learned not only to master large amounts of material but to also separate and integrate different viewpoints as appropriate. I also “field test” my protocols with patients in the various clinical arenas in which I work and also with professionals and

academicians via presentations and critical dialogue. By implementing these quality control steps, I hope to create a useful text and advance our professions and practices by improving the quality of care that we deliver to our patients.

How to Use This Book Most Effectively: Ideally, these books should be read cover-to-cover within a context of coursework that is supervised by a clinically experienced professor. For post-graduate professionals, they might consider forming a local or virtual “book club” and meeting for weekly or monthly discussions to check their understandings and share their clinical experiences to refine the application of clinical knowledge, perceptions, and skills. Virtual groups and internet forums—such as those hosted by International College of Human Nutrition and Functional Medicine at ICHNFM.ORG—can provide access to an assembly of international professional peers wherein sharing of clinical questions and experiences are synergistic. This book is not intended to extensively cover all aspects of clinical medicine, such as clinical pharmacology and prescribing (for which I recommend Epocrates.com and its associated app) and medical management (for which I recommend [5-Minute Clinical Consult](#) via book, website, and app).

Video access: Video access is provided via notices and footnotes appropriately placed and indicated throughout the book. Readers actually have to read the book to access the information and gain knowledge.

- **Sample:** vimeo.com/ichnfm/drv-functional-inflammolgy-intro2013
- **Password:** DrVprotocol

Notices: The intention and scope of this text are to provide health science students and doctorate-level clinicians with useful information and a familiarity with available research and resources pertinent to the management of patients in integrative primary care and specialty care settings. Specifically, the information in this book is intended to be used by licensed healthcare professionals who have received hands-on/residential clinical training and supervision at accredited health science colleges. Additionally, information in this book should be used in conjunction with other resources, texts, and in combination with the clinician’s best judgment and intention to “first, do no harm” and second to provide effective healthcare. Information and treatments applicable to a specific *condition* may not be appropriate for or applicable to a specific *patient* in your office; this is especially true for patients with multiple comorbidities and those taking pharmaceutical medications with potential for multiple adverse effects and drug/nutrient/herb interactions. In my books and articles, I describe treatments—manual, dietary, nutritional, botanical, pharmacologic, and occasionally surgical—and their research support for the clinical condition being discussed; each practitioner must determine appropriateness of these treatments for his/her individual patient and with consideration of the doctor’s scope of practice, education, training, skill, and—occasionally—the appropriateness of “off label” use of medications and treatments. This book has been carefully written and checked for accuracy by the author and professional colleagues. However, in view of the possibility of human error and new discoveries in the biomedical sciences, neither the author nor any party associated in any way with this text warrants that this text is perfect, accurate, or complete in every way, and we disclaim responsibility for harm or loss associated with the application of the material herein. With all conditions/treatments described herein, each physician must be sure to consider the balance between what is best for the patient and the physician’s own level of ability, expertise, and experience. When in doubt, or if the physician is not a specialist in the treatment of a given severe condition, referral is appropriate. These notes are written with the routine “outpatient” in mind and are not tailored to severely injured patients or “playing field” or “emergency response” situations; consult your First Aid and Emergency Response texts and course materials for appropriate information. These notes represent the author’s perspective based on academic education, experience, and post-graduate continuing education and are not inclusive of every fact that a clinician may need to know. This is not an “entry level” book except when used in an academic setting with a knowledgeable professor who can explain the concepts, tests, physical exam procedures, and

Purpose, scope, recommended companion resources

The purpose of this book is not to serve as a stand-alone "recipe book" for the complete management of all reviewed conditions; rather the focus of this book is the delivery of clinically important concepts and facts to enhance the management of various clinical disorders, in particular by documenting and explicating this author's naturopathic, allopathic, integrative and functional medicine approach. Readers and instructors using this book are encouraged to use whichever additional resources they choose, including but not limited to the supporting videos at Vimeo.com/DrVasquez and Vimeo.com/ICHNFM; in particular, [5-Minute Clinical Consult](#) and [Epocrates](#) are excellent and strongly advised companion guides for overall medical diagnosis/management and clinical pharmacology/prescribing, respectively. Clinicians need to have a good understanding of clinical medicine before applying many of the approaches described in this book; cross-referencing and double-checking management strategies and drug doses are essential components of quality care. Both [5-Minute Clinical Consult](#) and [Epocrates](#) are available as point-of-care references, and their use is advised.

This work is best used with the relevant videos from DrV available online, some of which are linked and made password-accessible via this book; additional videos by Dr Vasquez are available online (occasionally with accompanying printed presentation slides); please see the following examples and locations:

- vimeo.com/ichnfm
- vimeo.com/drvasquez

treatments; this book requires a certain level of knowledge from the reader and familiarity with clinical concepts, laboratory assessments, and physical examination procedures. Suggested doses—if any—are for adults (not infants and children) unless otherwise specified in context; the responsibility for appropriate dosing is of course that of the prescribing clinician in view of the patient's age, weight, overall state, hepatic and renal function, comorbidities, polypharmacy, etc.

Updates, Corrections, and Newsletter: When and if omissions, errata, and the need for important updates become clear, I will post these at the website InflammationMastery.com. A reader might access this page periodically to ensure staying informed of any corrections that might have clinical relevance. This book consists not only of the text in the printed pages you are holding, but also the footnotes and any updates at the website. If any clinically important corrections are made, they will be distributed by newsletter InflammationMastery.com/join_email.html and/or placed in the folder FunctionalInflammology.com/volume1/ (with analogous folders for subsequent volumes, e.g., [volume2](#), etc) for constant availability. Be alerted to new integrative clinical research, updates to this textbook and other news/publications/conferences/videos by registering for the free newsletter at ICHNFM.ORG.

Language, Semantics, and Perspective: As a diligent student who previously aspired to be an English professor, I have written this text with great (though inevitably imperfect) attention to detail. Individual words were chosen with care. I confess to knowing, pushing, and creatively breaking several rules of grammar and punctuation. With regard to the he/she and him/her debacle of the English language, I've occasionally mixed singular and plural pronouns for the sake of being efficient and so that the images remain gender-neutral to the extent reasonable. In several previous publications, the subtitle *The art of creating wellness while effectively managing acute and chronic musculoskeletal/health disorders* was chosen to emphasize the intentional creation of wellness rather than a limited focus on disease treatment and symptom suppression; for the 2009 printing of *Chiropractic and Naturopathic Mastery of Common Clinical Disorders*, this subtitle was slightly modified from "creating" to "co-creating" to emphasize the team effort required between physician and patient. *Managing* was chosen to emphasize the importance of treating-monitoring-referring-reassessing, rather than merely *treating*. *Disorders* was chosen to reflect the fact that a distinguishing characteristic of *life* is the ability to regularly create *organized structure* and *higher order* from chaos and *disorder*. For example, plants organize the randomly moving molecules of air and water into the organized structure of biomolecules which eventually take shape as plant structure—fiber, leaves, flowers, petals. Similarly, the human body creates organized structure of increased complexity from consumed plants and other foods; molecules ingested and inhaled from the environment are organized into specific biochemicals and tissue structures with distinct characteristics and definite functions. Injury and disease *result in* or *result from* a lack of order, hence my use of the word "disorders" to characterize human illness and disease. For example, a motor vehicle accident that results in bodily injury, for example, is an example of an external chaotic force, which, when imparted upon human body tissues, results in a disruption (disorder) of the normal structure and organization that previously defined and characterized the now-damaged tissues of the body; likewise, an autoimmune disease process that results in tissue destruction is an *anti-evolutionary* process that takes molecules of higher complexity and reverts them to simpler, fragmented, and non-functional forms. From the perspective of "health" as *organized structure and meaningful function* and "disease" as *the reversion to chaos, destruction of structure, and the loss of function*, the task of healthcare providers is essentially to restore order, and to acutely reduce and proactively prevent/eliminate clinical-biochemical-biomechanical-emotional chaos insofar as it adversely affects the patient's life experience as an individual and our collective experience as an interdependent society. What is required of clinicians then is the ability *first* to create conceptual order from what appears to be chaotic phenomena, and then *second* to materialize—make real and practically applied for patients/people seeking improved health—that conceptual order into our physical world; this is our task, and no small task it is. Also under this heading of Semantics and Language, I will make readers aware of the following additional facts. First, I tend to write very long sentences, both in general and at times when I want to connect two or more complex ideas; rather than be dismayed or discouraged by this occurrence, readers are encouraged to read these longer sentences more than just once and to engage actively, perhaps by asking, "Why is DrV making an effort to connect these ideas?" "**What is the conceptual advantage to the binding of these ideas together?**" I am aware of most of the rules of grammar, and I am generally—but not always—compliant. Second, I create new words and phrases as needed; an index of some of these is provided toward the back of the book, whereas some of these new terms are self-explanatory, e.g., *hypoinsulinreception*—underreception or lack of receptor responsiveness to insulin. When possible, I strongly prefer to use single words when discussing concepts, rather than multiple disparate words for singular concepts. I have started to prefer using *italics* rather than "quotation marks" when introducing new terms or when using terms/phrases/words with emphasis; the main purpose of this is to reduce the number of punctuation marks and character spaces, both of which over the course of a multi-volume work of 2,000 pages and hundreds of thousands of words are numerically significant. Last for this section, the *colorization* process that I began in April 2014 for my (larger) books is intended to 1) bring out more detail in my increasingly complex diagrams, 2) bring emphasis and highlighting to areas of particular interest, 3) make the work more visually stimulating/pleasing over the previous

black/white/grayscale versions, and—relatedly—4) to keep the work interesting as readers tread through a remarkable amount of complex and detailed information; I realize that some readers may at times find the colorization to be a small distraction, but I think this is better than the alternative of monotony induced by several hundred dense pages of grayscale.

Integrity and Creativity: I have endeavored to accurately represent the facts as they have been presented in texts and research, and to specifically resist any temptation to embellish or misrepresent data as others have done.^{8,9} Conversely, I have not endeavored to make this book appeal to the “average” student or reader; my goal is to write and teach to the students at the top of the class, thereby affirming them and pulling the other students forward and upward. While I offer *explanations*, I intentionally resist *simplifications*, except when one simplification might facilitate the comprehension of a more complex phenomenon, or when such a simplification might facilitate the conveyance of information from clinician to patient. I have allowed this text to be unique in format, content, and style, so that the personality of this text can be contrasted with that of the instructor and reader, thus enabling the learner to at least benefit from an intentionally different – and intentionally honest – perspective and approach. Students using this text with the guidance of a qualified professor will benefit from the experience of “two teachers” rather than just one.

Linearity, Nonlinearity, Redundancy, Asynchronicity: Although the overall flow of the text is highly linear and sequential, occasionally I place a conclusion before its introduction for the sake of foreshadowing and therefore for preparing the reader for what is to come. The purpose of this is not simply one of preparation for the sake of allowing the reader to know what is already lying ahead on the path, but more to begin creating new “shelf space” in the reader’s intellectual-neuronal “library” so that when the new—particularly if *neoparadigmatic*—information is encountered, a space will already exist for it; in other words: the intent is to make learning easier. Likewise, for the sake of *information retention*—or what is physiologically understood as synaptogenesis—important points are presented more than once, either identically or variantly. Given that “*No one ever reads the same book twice*”¹⁰ (because the “person who starts” the reading of a meaningful book is changed into the “person who finishes” the reading of that book (assuming proper intentionality and application of one’s “self”), the person reading these words might consider a second glance after the first. For the sake of efficient use of space I have tried to minimize redundancy; however, in a few locations, redundancy of text and images proved necessary as—for example—viewing the same diagram within two different conversations allows the reader to gain a more profound understanding of the concepts by viewing them from two different contexts.

Bon Voyage: All artists and scientists—regardless of genre—grapple with the divergent goals of *perfecting* their work and *presenting* their work; the former is impossible in the ultimate sense, while the latter is the only means by which the effort can create the desired effect in the world, whether that is pleasure, progress, or both. At some point, we must all agree that it is “good enough” and that it contains the essence of what needs to be communicated. While neither this nor any future edition of this book is likely to be “perfect”, I am content with the literature reviewed, presented, and the new conclusions and implications which are described—many for the first time ever—in this text. Firstly in and progressively from my *Integrative Rheumatology* (2006), each chapter achieved/achieves a paradigm shift which distanced/distances us farther from the simplistic pathocentric and pharmacocentric model and toward one which authentically empowers both practitioners and patients. With time, I will make future editions more complete, consistently passionate, and either more or less polemical. I hope you are able to implement these conclusions and research findings *into your own life* and into the *treatment plans for your patients*. Hopefully this work’s value and veracity will promote patients’ vitality via the vigilant and virtuous clinicians viewing this volume; to the more attentive and thoroughgoing reader, more is revealed (for example, the last sentence is a reference to the descriptive and prophetic movie *V for Vendetta* (2006).

Thank you for engaging with this work, and I wish you and your patients the best of success and health.

Alex Vasquez

Alex Vasquez, D.C., N.D., D.O., F.A.C.N.
January 26, 2016

⁸ Vasquez A. Zinc treatment for reduction of hyperplasia of prostate. *Townsend Letter for Doctors and Patients* 1996; January: 100

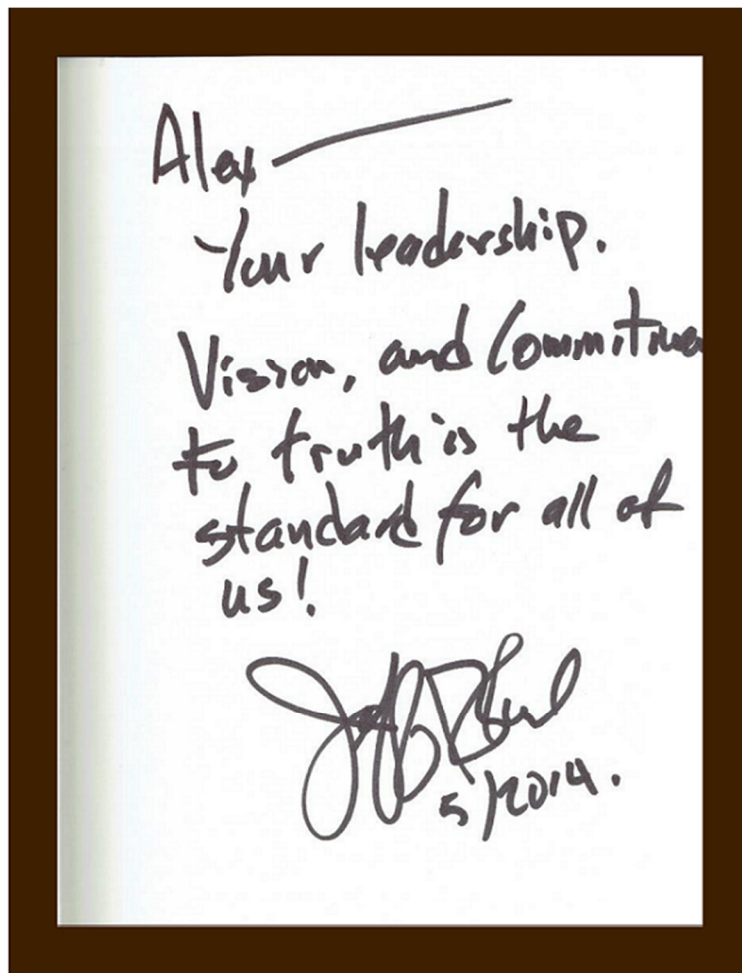
⁹ Broad W, Wade N. *Betrayers of the Truth: Fraud and Deceit in the Halls of Science*. New York: Simon and Schuster; 1982

¹⁰ Davies R. *Reading and Writing*. Salt Lake City: University of Utah Press; 1992, page 23



Living color, more vitality: The "colorization" process for the interior of this book began in April 2014 in Bogotá (above) and Cartagena Colombia (below).





Pictured above—Personal inscription from Dr. Jeffrey Bland at a book signing event for his book *Disease*

Delusion: My inclusion of Dr Bland's personal note above is not meant to imply that he is endorsing this book; he might very well reject any or all of it. Further, this inclusion does not imply that he carries those same sentiments beyond the day that he wrote them to me in May of 2014. Rather, my inclusion signifies our mutual respect as colleagues, and my personal respect for his thought and demeanor, and his influence on my life and work. I have respectfully honored him in this book as the founder of what most clinicians in America know as Functional Medicine, and I have developed and extended my own version of his concept—that disease states are malleable rather than destined—to the clinical management of inflammatory disorders under the name of Functional Inflammalogy. Importantly and personally—but not paradoxically if one understands the true goals of mentorship, affiliation, and friendship—due to the support of friends and colleagues, this book also represents a departure from concern that I had for endorsement from or agreement with other people, professions, universities, or organizations. In this book, I have presented the truth as I see it—without apology—and without any filtering other than as the limitations imposed by time, space, my own abilities, and limitations imposed by human physiology. This work—now published as *Inflammation Mastery, 4th Edition*—has been "in progress" since its origin as course notes for Orthopedics and Rheumatology which I taught at Bastyr University in Seattle in 2000-2001 and through its previous publications in many books starting with *Integrative Orthopedics* (2004) and *Integrative Rheumatology* (2006) and peer-reviewed articles in journals ranging from *Annals of Pharmacotherapy* to *Alternative Therapies in Health and Medicine*. In addition to spanning more than 16 years, this work has also spanned various countries and cultures—including Houston, Fort Worth, Austin (Texas), Seattle (Washington), Portland (Oregon) in the United States, then to Bogota, Colombia and Barcelona, Spain. I consider this volume to be my highest presentation of truth, accuracy, and clinical application that I could humanly muster while maintaining my own health, relationship, and other obligations. I will always remain open to correction and the updating of this work as the weight of evidence indicates. The goals of healthcare should be the optimization of physical health and psychosocial-intellectual freedom.

Reviews of previous and recent works:

- "Thank you most kindly for your incredible dedication and kindness in sharing your knowledge with us. I am due to start med school next semester and thanks to you and all those who have taught you, I'll be way ahead of the curve." *Premedical/Medical student 2015*
- "Dr Vasquez, I have followed your work extensively and admire your intellect and passion. Thank you for your passion for teaching with integrity!" *Chiropractic doctor 2015*
- "I just wanted to tell you how much I appreciate the information I have received from you. I am still digesting most of it. I feel I have learned quite a bit already yet also feel I have barely scratched the surface." *Doctor and Graduate student under Dr Vasquez, 2013*
- "Dr. Vasquez, Thank you for all you do. **Your conference was simply amazing.** No one wanted to leave the room. I met medical professionals and very interesting lay people who were stimulated and invigorated to change their lives and the lives of others. **I am in awe at your intellectual integrity and veracity.** Best of luck to you in all of your future endeavors." *Medical physician and ICHNFM 2013 Conference Attendee*
- **2014 review of Functional Inflammolgy, Volume 1: "A truly comprehensive text on the vast subject of inflammation. I consider this book to be an essential addition to any health care practitioner who wishes to operate within the realm of Function Medicine. Please be aware that this book is dense in its content, and its 700 plus pages are full of deeply insightful information. I think Dr. Vasquez is one of the most prolific functional medicine contributors and books such as this should cement his reputation as such."**
- "I attended the last ICHNFM conference in Portland (and am still basking in the amazing information received)." *Email from Clinical Oncology Dietitian, in late February 2014*
- "Thanks for a fantastic conference!" *ICHNFM 2013 Conference Attendee*
- "Your discourse today reflected not only your passion and commitment to the wellness of our planet but most importantly the clarity and sincerity of your spirit/ heart/ mind. Always good to be with you and look forward to seeing you soon. Hope we can spend more time then." *Medical physician attendee 2014*
- "I was so refreshed by the **unfiltered excellence.** What humanness. Breaths of fresh air." *ICHNFM 2013 Attendee*
- "Keep in mind Alex, that humanity is a better place because of you. I know you can't undo it all, but think about how many people would be worse off if it wasn't for your wonderful knowledge being shared with all us docs. Things that I have learned from you have changed peoples' lives for the better." *Naturopathic physician, 2014*
- "Just got back to Guam. Great experience at the International Conference on Human Nutrition and Functional Medicine. Exciting concepts on functional medicine. Thanks Dr. Alex Vasquez and team!" *ICHNFM 2013 Conference Attendee*
- "Already waiting in line to buy next year's ticket! **Dr. Vasquez you crushed it!** The future is looking fun already ☺" *ICHNFM 2013 Conference Attendee*
- "Had an incredible time at the 2013 International Conference on Human Nutrition and Functional Medicine. Got to meet some amazing people and hear from some of the top researchers/health professionals about human nutrition and functional medicine approaches. It was definitely worth every penny and can't wait to go back next year!" *ICHNFM 2013 Conference Attendee*
- "I miss you! Your confidence in a program you believed in. I miss your live classes where we would get off topic on a clinical pearl. I miss your way of teaching in a laid back atmosphere that made me feel comfortable, not intimidated. I just needed to let you know, this program is not the same, I am almost done, otherwise, I would have bailed out! I am grateful for the last 18 months I did have with you at the helm. ... You ignited in me my passion for learning again. You sparked the minds of all of us with your enthusiasm. Don't ever let anyone take that away. It has given birth to your new endeavor, and we will follow where you lead. Enjoy your new surroundings and celebrate your new beginnings. I know I look forward to what is ahead." *Doctor and Graduate student under Dr Vasquez, 2013*
- "Wonderful conference! Thanks so much." *ICHNFM 2013 Conference Attendee*
- "Really wonderful conference! Lots of material ready to implement Monday morning! **Congrats to Alex Vasquez on a herculean job very well done!**" *ICHNFM 2013 Conference Attendee*
- "Thanks for a great conference. I really enjoyed all of the speakers, but your lectures were by far the most useful for implementing ideas into my clinical practice. And the most entertaining." *ICHNFM 2013 Conference Attendee*
- "Thank you for your life-changing work." *Physician, 2011*
- "I want Dr. Vasquez to know that I have just received his book, *Chiropractic and Naturopathic Mastery of Common Clinical Disorders*. **It is a treasure. The best book in my library.** Thank you for the contribution that you are giving to the world of health care." *Clinician, 2010*
- "I appreciate the resources you offer the profession. I use your books and articles regularly." *Doctor, 2011*
- "Dr. Vasquez, I greatly appreciate your efforts. I am a student at ___, 8th trimester, and would like to express my gratitude for your research and works. After coming across your texts in the library, **I quickly found your insight and explanations of the current health care crisis, and in depth coverage and algorithms for inflammatory**

diseases as a profound inspiration and call to action. I appreciate your attention to detail, and have been taken back several times by the potency and meaning of your sentences. Thank you for your hard work, I will enjoy these books and will surely share with those that have the same drive for true and competent patient care." *Health Sciences Student, 2008*

- "I never told you this, but whenever I need to research a particular disease, **besides going on Pubmed and checking some classic Pathophysiology and Clinical Nutrition books, I use your books and I find them extremely well organized, concise, and up-to-date and with the functional/integrative medicine thinking I enjoy and believe it is the future of Health Care.**" *Nutrition Research Consultant and University Faculty in Europe, 2009*
- "Thanks so much. You are a great asset to our profession." *Doctor, 2010*
- "As a 7th trimester student quickly approaching 8th trimester and student clinic, I know I will be utilizing your books often. **Your "Chiropractic and Naturopathic Mastery of Common Clinical Disorders" book is referenced very frequently by many clinicians and faculty members at [our university]. Your work is highly regarded,** and I look forward to clinically utilizing the information I will obtain from your writings." *Health Sciences Student, 2011*
- "I am a chiropractic student at ___ Chiropractic College. I just wanted to drop a quick line thanking you for your thorough and accessible textbook Integrative Orthopedics. We are using it in our Differential Diagnosis class, and **it is the best book I've come across in Chiropractic College bar none. The writing is concise, informative and refreshingly eloquent. The material is super practical. I hope you continue putting out great resources.**" *Health Sciences Student, 2011*
- "I appreciate the resources you offer the profession. **I use your books and articles regularly.**" *Doctor, 2011*
- "**Your Integrated Orthopedics book is magnificent.** I wish all textbooks were structured and as thoughtful as that one." *Health Sciences Student, 2008*
- "By reading the introduction I realize that calling it an orthopedics book; does not do it justice. **It is far more than that. It looks to me that you have created, or are creating, the bible of Integrative Orthopedics and physical medicine.**" *Physician, 2007*
- "First of all let me say how honored I am that you have allowed me to review this work. You have done an amazing job! In my opinion **every healthcare provider SHOULD have this on their bookshelf.**" *Physician, 2007*
- "Your work on Chapter 12: Hip and Thigh is very good. The chapter is inclusive of the typical pathologies seen in private practice and I particularly liked the separation of juvenile from adult pathologies. Your choice of tests to assess hip and thigh pathology on page 320 is very nice and inclusive. I appreciate your use of algorithms and find them very useful in teaching and in practice. In general, **I thought this chapter represents a quality, state of the art presentation!**" *Clinician and Professor in Clinical Sciences, 2007*
- "I saw your books in a colleague's office and was really impressed. Really appreciate the thoroughness you've put into them." *Doctor, 2010*
- "**It is with great interest and fascination that I have been reading your material both in your two books (Integrative Orthopedics and Integrative Rheumatology) and online. I consider myself very fortunate to have come across your work,** as many of the basic elements of health which you discuss I never learnt or even heard about while in chiropractic college." *Doctor, 2010*
- "I appreciate the resources you offer the profession. I use your books and articles regularly." *Doctor, 2011*
- "**I'm so pleased with your books and was inspired to let you know they have already been incredibly useful! Good index; well organized algorithms. Sometimes I buy educational material and it just sort of sits there... Your books now live on my main desk. Thanks.**" *Physician and Journal Editor, 2009*
- "I just wanted to let you know how much I am enjoying reading **your book Integrative Rheumatology. It is having an extremely positive impact in the way I view health and am having a tough time putting it down. It is very inspirational.** I have long felt that it is very important to set a good example for your patients and now try my best to be one for my future patients. I like how you stress this in your book. In order to be the best example for my patients I am going to need to address some problems with my own health. I look healthy from the outside but I have been suffering from fatigue for about 4 years. It has a very negative impact on my health. People say that doing the same thing and expecting different results is the definition of insanity so I think it is time that I attempt to make some changes. ... **Thanks again for writing such a great book. I feel it is a must have for anyone in a musculoskeletal practice.**" *Health Sciences Student, 2010*
- "My name is [recent graduate], and I've been a fan of your books since I was in chiropractic college at [university] campus. Dr. [Author, Presenter] made your book, Integrative Rheumatology, required reading for his 9th quarter nutrition class. I never looked back, and have since purchased Chiropractic & Naturopathic Mastery of Common Clinical Disorders as well as Chiropractic Management of Chronic Hypertension." *Doctor, 2010*
- "I saw your books in a colleague's office and was really impressed. Really appreciate the thoroughness you've put into them." *Doctor, 2010*

- "Reading the new integrative management of high blood pressure book and I am thoroughly enjoying it; excellent job. **I am feeling so empowered I'm opening another office focusing on 'restoring the foundations of health' for the community** that I open it in. I am looking for a location and networking to find an internist and cardiologist that are forward thinking; I'm very excited!" *Doctor, 2011*
- "Thank you for the presentation at [the university] this past weekend. **My horizons about what can be done to help people were greatly expanded. I am now still studying the notes from the seminar and am looking forward to more study and learning on how to correctly manage diabetes and hypertension.**" *Doctor, 2011*
- "Thank you for exposing so many people to the results of our research on the treatment of hypertension. I hope you can pay us a visit during your next trip to our area so we can give you the tour of our new 50+ bed inpatient facility." *Dr Alan Goldhamer, Chief of Health Promoting Clinic, 2010*
- **"I always enjoy reading your work.** I personally gain a lot of knowledge through being a peer-reviewer for you and am better because of it!" *Doctor, Faculty Member, and Postgraduate Instructor, 2011*
- **"I attended your seminar at [University] in June and have been utilizing your hypertension protocols. In that short time, I have seen some marked progress with various patients."** *Doctor, 2010*
- "I want to personally thank you for your expertise and books on...everything. I'm in my last year at SCNM (taking rheumatology right now) and I truly admire your research and ability to compile valuable information. Thank you." *Naturopathic Medical Student, 2014*

Work as love made tangible

"You work that you may keep pace with the earth and the soul of the earth.
For to be idle is to become a stranger unto the seasons, and to step out of life's
procession. ...
Work is love made visible."

Kahlil Gibran (1883-1930). *The Prophet*, 1973

Begin at the beginning

"He who wishes one day to *fly*, must first learn *standing*
and *walking*
and *running*
and *climbing*
and *dancing*.
One does not *fly* into *flying*."

Friedrich Nietzsche (1844-1900). *Thus Spoke Zarathustra—A Book for All and None*, 1883-1885

Examples of commonly used abbreviations:

- **25-OH-D** = serum 25-hydroxy-vitamin D(3)
- **ACEi** = angiotensin-2 converting enzyme inhibitor
- **Alpha-blocker** = alpha-adrenergic antagonist
- **ANA** = antinuclear antibodies
- **ARB** = angiotensin-2 receptor blocker/antagonist
- **ARF** = acute renal failure
- **BB** = beta blocker or beta-adrenergic antagonist
- **bHB, BHB** = beta-hydroxy-butyrate
- **BMP** = basic metabolic panel, includes serum Na, K, Cl, CO₂, BUN, creatinine, and glucose
- **BP** = blood pressure, relatedly **HBP** = high blood pressure
- **BUN** = blood urea nitrogen
- **C and S** = culture and sensitivity
- **CAD** = coronary artery disease
- **CBC** = complete blood count
- **CCB** = calcium channel blocker/antagonist
- **CE** = cardiac enzymes, including creatine kinase (CK), creatine kinase myocardial band (CKMB), and troponin-1, with the latter being the most specific serologic marker for acute myocardial injury; for the evaluation of acute MI, these are generally tested 2-3 times at 6-hour intervals with ECG performed at least as often.
- **CHF** = congestive heart failure
- **CHO, carb** = carbohydrate
- **CK** = creatine kinase, historically named creatine phosphokinase (CPK)
- **CKD** = chronic kidney disease, generally stratified into five stages based on GFR of roughly <90, 90-60, 60-30, 30-15, and >15, respectively
- **CMP** = comprehensive metabolic panel, also called a chemistry panel, includes the BMP along with markers of hepatic status albumin, protein, ALT, AST, may also include alkaline phosphatase and rarely GGT; panels vary per laboratory and hospital.
- **CNS** = central nervous system
- **COPD** = chronic obstructive pulmonary disease
- **CRF, CRI** = chronic renal failure/insufficiency
- **CRP** = c-reactive protein, hsCRP = high-sensitivity c-reactive protein
- **CT** = computed tomography
- **CVD** = cardiovascular disease
- **CXR** = chest X-ray
- **DM** = diabetes mellitus
- **DMARD** = disease-modifying antirheumatic drugs
- **ECG or EKG** = electrocardiograph
- **Echo** = echocardiography
- **ERS** = endoplasmic reticulum stress
- **GFR** = glomerular filtration rate
- **HDL** = high density lipoprotein cholesterol
- **HTN** = hypertension
- **Ig** = immune globulin = antibodies of the G, A, M, E, or D classes.
- **IHD** = ischemic heart disease
- **I+D** = incision and drainage
- **IM, IV** = intramuscular, intravenous
- **LPS** = bacterial lipopolysaccharide, endotoxin
- **MCV** = mean cell volume
- **MI** = myocardial infarction
- **Mito** = mitochondria(l)
- **MRI** = magnetic resonance imaging, **MRA** = magnetic resonance angiography
- **mTOR** = mechanistic or mammalian receptor of rapamycin; **TOR** is also reasonable
- **NfκB** = nuclear transcription factor kappa beta
- **PNS** = peripheral nervous system
- **PRN** = from the Latin "pro re nata" meaning "on occasion" or "when necessary"
- **PTH** = parathyroid hormone, iPTH = intact parathyroid hormone
- **PVD** = peripheral vascular disease
- **RA** = rheumatoid arthritis
- **RAD** = reactive airway disease, asthma
- **SIBO** = small intestine bacterial overgrowth
- **SLE** = systemic lupus erythematosus
- **TLR** = Toll-like receptor
- **TRIG(s)** = serum triglycerides
- **UA** = urinalysis
- **UPR** = unfolded protein response
- **US** = ultrasound

Dosing shorthand:

- **bid** = twice daily
- **cc** = with meals
- **hs** = at bedtime
- **ic** = between meals
- **po** = per os = by mouth
- **prn** = as needed (additional details above)
- **q** = each
- **qd** = each day, also /d or /day
- **qid** = four times per day
- **tid** = thrice daily
- **yo** = years old

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Appendix—2015 media and excipients for common vaccines from the US Centers for Disease Control (CDC):

Observance is made here—with selected highlights of common allergens and immunogens—of potential allergens to which patients may respond; by use of this information, clinicians can make better choices regarding the selection or avoidance of particular vaccines in patients with known allergies or possible hypersensitivity reactions. For example, according to the recent study by Zug et al¹, among 883 North American children approximately 60% have positive (ie, allergic) responses to substances via patch testing, and neomycin sulfate (a component of some vaccines) sensitivity is one of the more common allergies/hypersensitivities. Thus this list helps clinicians identify potential hypersensitivity reactions that might be triggered by vaccine ingredients. This document is available as of early 2016 via the CDC website at this location: <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/excipient-table-2.pdf>

Vaccine Excipient & Media Summary

Excipients Included in U.S. Vaccines, by Vaccine

This table includes not only vaccine ingredients (e.g., adjuvants and preservatives), but also substances used during the manufacturing process, including vaccine-production media, that are removed from the final product and present only in trace quantities.
In addition to the substances listed, most vaccines contain Sodium Chloride (table salt).

Last Updated February 2015

All reasonable efforts have been made to ensure the accuracy of this information, but manufacturers may change product contents before that information is reflected here. If in doubt, check the manufacturer's package insert.

Vaccine	Contains	Source: Manufacturer's P.I. Dated
Adenovirus	sucrose, D-mannose, D-fructose, dextrose, potassium phosphate, plasdone C, anhydrous lactose, micro crystalline cellulose, polacrillin potassium, magnesium stearate, cellulose acetate phthalate, alcohol, acetone, castor oil, FD&C Yellow #6 aluminum lake dye , human serum albumin , fetal bovine serum , sodium bicarbonate, human-diploid fibroblast cell cultures (WI-38) , Dulbecco's Modified Eagle's Medium, monosodium glutamate	March 2011
Anthrax (Biothrax)	aluminum hydroxide, benzethonium chloride, formaldehyde , amino acids, vitamins, inorganic salts and sugars	May 2012
BCG (Tice)	glycerin, asparagine, citric acid, potassium phosphate, magnesium sulfate, Iron ammonium citrate, lactose	February 2009
DT (Sanofi)	aluminum potassium sulfate, peptone, bovine extract, formaldehyde , thimerosal (trace), modified Mueller and Miller medium, ammonium sulfate	December 2005
DTaP (Daptacel)	aluminum phosphate, formaldehyde , glutaraldehyde , 2-Phenoxyethanol, Stainer-Scholte medium, modified Mueller's growth medium, modified Mueller-Miller casamino acid medium (without beef heart infusion), dimethyl 1-beta-cyclodextrin, ammonium sulfate	October 2013
DTaP (Infanrix)	formaldehyde , glutaraldehyde , aluminum hydroxide, polysorbate 80, Fenton medium (containing bovine extract), modified Latham medium (derived from bovine casein), modified Stainer-Scholte liquid medium	November 2013
DTaP-IPV (Kinrix)	formaldehyde , glutaraldehyde , aluminum hydroxide, Vero (monkey kidney) cells , calf serum, lactalbumin hydrolysate, polysorbate 80, neomycin sulfate, polymyxin B , Fenton medium (containing bovine extract), modified Latham medium (derived from bovine casein), modified Stainer-Scholte liquid medium	November 2013
DTaP-HepB-IPV (Pediatrix)	formaldehyde , glutaraldehyde , aluminum hydroxide, aluminum phosphate, lactalbumin hydrolysate, polysorbate 80, neomycin sulfate, polymyxin B , yeast protein, calf serum, Fenton medium (containing bovine extract), modified Latham medium (derived from bovine casein), modified Stainer-Scholte liquid medium, Vero (monkey kidney) cells	November 2013
DTaP-IPV/Hib (Pentacel)	aluminum phosphate, polysorbate 80, formaldehyde , sucrose, glutaraldehyde , bovine serum albumin, 2-phenoxethanol, neomycin , polymyxin B sulfate , Mueller's Growth Medium, Mueller-Miller casamino acid medium (without beef heart infusion), Stainer-Scholte medium (modified by the addition of casamino acids and dimethyl-beta-cyclodextrin), MRC-5 (human diploid) cells , CMRL 1969 medium (supplemented with calf serum), ammonium sulfate, and medium 199	October 2013
Hib (ActHIB)	ammonium sulfate, formalin , sucrose, Modified Mueller and Miller medium	January 2014
Hib (Hiberix)	formaldehyde , lactose, semi-synthetic medium	March 2012
Hib (PedvaxHIB)	aluminum hydroxophosphate sulfate, ethanol, enzymes, phenol , detergent , complex fermentation medium	December 2010

¹ Zug et al. Patch testing in children from 2005 to 2012: results from the North American contact dermatitis group. *Dermatitis*. 2014 Nov-Dec;25(6):345-55

Vaccine	Contains	Source: Manufacturer's P.I. Dated
Hib/Hep B (Comvax)	yeast (vaccine contains no detectable yeast DNA), nicotinamide adenine dinucleotide, hemin chloride, soy peptone, dextrose, mineral salts, amino acids, formaldehyde, potassium aluminum sulfate, amorphous aluminum hydroxyphosphate sulfate, sodium borate, phenol, ethanol, enzymes, detergent	December 2010
Hib/Mening. CY (MenHibrix)	tris (trometamol)-HCl, sucrose, formaldehyde, synthetic medium, semi-synthetic medium	2012
Hep A (Havrix)	aluminum hydroxide, amino acid supplement, polysorbate 20, formalin, neomycin sulfate, MRC-5 cellular proteins	December 2013
Hep A (Vaqta)	amorphous aluminum hydroxyphosphate sulfate, bovine albumin, formaldehyde, neomycin, sodium borate, MRC-5 (human diploid) cells	February 2014
Hep B (Engerix-B)	aluminum hydroxide, yeast protein, phosphate buffers, sodium dihydrogen phosphate dihydrate	December 2013
Hep B (Recombivax)	yeast protein, soy peptone, dextrose, amino acids, mineral salts, potassium aluminum sulfate, amorphous aluminum hydroxyphosphate sulfate, formaldehyde, phosphate buffer	May 2014
Hep A/Hep B (Twinrix)	formalin, yeast protein, aluminum phosphate, aluminum hydroxide, amino acids, phosphate buffer, polysorbate 20, neomycin sulfate, MRC-5 human diploid cells	August 2012
Human Papillomavirus (HPV) (Cervarix)	vitamins, amino acids, lipids, mineral salts, aluminum hydroxide, sodium dihydrogen phosphate dehydrate, 3-O-desacyl-4' Monophosphoryl lipid A, insect cell, bacterial, and viral protein	November 2013
Human Papillomavirus (HPV) (Gardasil)	yeast protein, vitamins, amino acids, mineral salts, carbohydrates, amorphous aluminum hydroxyphosphate sulfate, L-histidine, polysorbate 80, sodium borate	June 2014
Human Papillomavirus (HPV) (Gardasil 9)	yeast protein, vitamins, amino acids, mineral salts, carbohydrates, amorphous aluminum hydroxyphosphate sulfate, L-histidine, polysorbate 80, sodium borate	December 2014
Influenza (Afluria)	beta-propiolactone, thimerosal (multi-dose vials only), monobasic sodium phosphate, dibasic sodium phosphate, monobasic potassium phosphate, potassium chloride, calcium chloride, sodium taurodeoxycholate, neomycin sulfate, polymyxin B, egg protein, sucrose	December 2013
Influenza (Agrimflu)	egg proteins, formaldehyde, polysorbate 80, cetyltrimethylammonium bromide, neomycin sulfate, kanamycin, barium	2013
Influenza (Fluarix) Trivalent and Quadrivalent	octoxynol-10 (Triton X-100), α -tocopheryl hydrogen succinate, polysorbate 80 (Tween 80), hydrocortisone, gentamicin sulfate, ovalbumin, formaldehyde, sodium deoxycholate, sucrose, phosphate buffer	June 2014
Influenza (Flublok)	monobasic sodium phosphate, dibasic sodium phosphate, polysorbate 20, baculovirus and host cell proteins, baculovirus and cellular DNA, Triton X-100, lipids, vitamins, amino acids, mineral salts	March 2014
Influenza (Flucelvax)	Madin Darby Canine Kidney (MDCK) cell protein, MDCK cell DNA, polysorbate 80, cetyltrimethylammonium bromide, β -propiolactone, phosphate buffer	March 2014
Influenza (Fluvirin)	nonylphenol ethoxylate, thimerosal (multidose vial—trace only in prefilled syringe), polymyxin, neomycin, beta-propiolactone, egg proteins, phosphate buffer	February 2014
Influenza (Flulaval) Trivalent and Quadrivalent	thimerosal, formaldehyde, sodium deoxycholate, egg proteins, phosphate buffer	February 2013
Influenza (Fluzone: Standard (Trivalent and Quadrivalent), High-Dose, & Intradermal)	formaldehyde, octylphenol ethoxylate (Triton X-100), gelatin (standard trivalent formulation only), thimerosal (multi-dose vial only), egg protein, phosphate buffers, sucrose	2014

Vaccine	Contains	Source: Manufacturer's P.I. Dated
Influenza (FluMist) Quadrivalent	ethylene diamine tetraacetic acid (EDTA), monosodium glutamate, hydrolyzed porcine gelatin, arginine, sucrose, dibasic potassium phosphate, monobasic potassium phosphate, gentamicin sulfate, egg protein	July 2013
Japanese Encephalitis (Ixiaro)	aluminum hydroxide, Vero cells, protamine sulfate, formaldehyde, bovine serum albumin, sodium metabisulphite, sucrose	May 2013
Meningococcal (MCV4-Menactra)	formaldehyde, phosphate buffers, Mueller Hinton agar, Watson Scherp media, Modified Mueller and Miller medium, detergent, alcohol, ammonium sulfate	April 2013
Meningococcal (MCV4-Menveo)	formaldehyde, amino acids, yeast extract, Franz complete medium, CY medium	August 2013
Meningococcal (MPSV4-Menomune)	thimerosal (multi-dose vial only), lactose, Mueller Hinton casein agar, Watson Scherp media, detergent, alcohol	April 2013
Meningococcal (MenB – Bexsero)	aluminum hydroxide, E. coli, histidine, sucrose, deoxycholate, kanomycin	2015
Meningococcal (MenB – Trumenba)	polysorbate 80, histidine, E. coli, fermentation growth media	October 2015
MMR (MMR-II)	Medium 199 (vitamins, amino acids, fetal bovine serum, sucrose, glutamate), Minimum Essential Medium, phosphate, recombinant human albumin, neomycin, sorbitol, hydrolyzed gelatin, chick embryo cell culture, WI-38 human diploid lung fibroblasts	June 2014
MMRV (ProQuad)	sucrose, hydrolyzed gelatin, sorbitol, monosodium L-glutamate, sodium phosphate dibasic, human albumin, sodium bicarbonate, potassium phosphate monobasic, potassium chloride, potassium phosphate dibasic, neomycin, bovine calf serum, chick embryo cell culture, WI-38 human diploid lung fibroblasts, MRC-5 cells	March 2014
Pneumococcal (PCV13 – Prevnar 13)	casamino acids, yeast, ammonium sulfate, Polysorbate 80, succinate buffer, aluminum phosphate, soy peptone broth	January 2014
Pneumococcal (PPSV-23 – Pneumovax)	phenol	May 2014
Polio (IPV – Ipol)	2-phenoxyethanol, formaldehyde, neomycin, streptomycin, polymyxin B, monkey kidney cells, Eagle MEM modified medium, calf serum protein, Medium 199	May 2013
Rabies (Imovax)	Human albumin, neomycin sulfate, phenol red indicator, MRC-5 human diploid cells, beta-propiolactone	April 2013
Rabies (RabAvert)	β-propiolactone, potassium glutamate, chicken protein, egg protein, neomycin, chlortetracycline, amphotericin B, human serum albumin, polygeline (processed bovine gelatin), sodium EDTA, bovine serum	March 2012
Rotavirus (RotaTeq)	sucrose, sodium citrate, sodium phosphate monobasic monohydrate, sodium hydroxide, polysorbate 80, cell culture media, fetal bovine serum, vero cells [DNA from porcine circoviruses (PCV) 1 and 2 has been detected in RotaTeq. PCV-1 and PCV-2 are not known to cause disease in humans.]	June 2013
Rotavirus (Rotarix)	amino acids, dextran, sorbitol, sucrose, calcium carbonate, xanthan, Dulbecco's Modified Eagle Medium (potassium chloride, magnesium sulfate, ferric (III) nitrate, sodium phosphate, sodium pyruvate, D-glucose, concentrated vitamin solution, L-cystine, L-tyrosine, amino acids solution, L-glutamine, calcium chloride, sodium hydrogenocarbonate, and phenol red) [Porcine circovirus type 1 (PCV-1) is present in Rotarix. PCV-1 is not known to cause disease in humans.]	May 2014
Smallpox (Vaccinia – ACAM2000)	human serum albumin, mannitol, neomycin, glycerin, polymyxin B, phenol, Vero cells, HEPES	September 2009

Vaccine	Contains	Source: Manufacturer's P.I. Dated
Td (Decavac)	aluminum potassium sulfate, peptone, formaldehyde, thimerosal, bovine muscle tissue (US sourced), Mueller and Miller medium, ammonium sulfate	March 2011
Td (Tenivac)	aluminum phosphate, formaldehyde, modified Mueller-Miller casamino acid medium without beef heart infusion, ammonium sulfate	April 2013
Td (Mass Biologics)	aluminum phosphate, formaldehyde, thimerosal (trace), ammonium phosphate, modified Mueller's media (containing bovine extracts)	February 2011
Tdap (Adacel)	aluminum phosphate, formaldehyde, glutaraldehyde, 2-phenoxyethanol, ammonium sulfate, Stainer-Scholte medium, dimethyl-beta-cyclodextrin, modified Mueller's growth medium, Mueller-Miller casamino acid medium (without beef heart infusion)	March 2014
Tdap (Boostrix)	formaldehyde, glutaraldehyde, aluminum hydroxide, polysorbate 80 (Tween 80), Latham medium derived from bovine casein, Fenton medium containing a bovine extract, Stainer-Scholte liquid medium	February 2013
Typhoid (inactivated – Typhim Vi)	hexadecyltrimethylammonium bromide, formaldehyde, phenol, polydimethylsiloxane, disodium phosphate, monosodium phosphate, semi-synthetic medium	March 2014
Typhoid (oral – Ty21a)	yeast extract, casein, dextrose, galactose, sucrose, ascorbic acid, amino acids, lactose, magnesium stearate, gelatin	September 2013
Varicella (Varivax)	sucrose, phosphate, glutamate, gelatin, monosodium L-glutamate, sodium phosphate dibasic, potassium phosphate monobasic, potassium chloride, sodium phosphate monobasic, potassium chloride, EDTA, residual components of MRC-5 cells including DNA and protein, neomycin, fetal bovine serum, human diploid cell cultures (WI-38), embryonic guinea pig cell cultures, human embryonic lung cultures	March 2014
Yellow Fever (YF-Vax)	sorbitol, gelatin, egg protein	May 2013
Zoster (Shingles – Zostavax)	sucrose, hydrolyzed porcine gelatin, monosodium L-glutamate, sodium phosphate dibasic, potassium phosphate monobasic, neomycin, potassium chloride, residual components of MRC-5 cells including DNA and protein, bovine calf serum	February 2014

A table listing vaccine excipients and media *by excipient* can be found in:

Grabenstein JD. *ImmunoFacts: Vaccines and Immunologic Drugs* – 2013 (38th revision). St Louis, MO: Wolters Kluwer Health, 2012.

From: <http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/appendices/B/excipient-table-2.pdf> on 2016 January